of $1 + r_1 : 1 + r_2$, where r_1 and r_2 are the reflection coefficients of the two surfaces.

The Distribution of Energy in the Visible Spectrum. EDWARD L. NICHOLS, Cornell University. (To be published in the *Physical Review.*)

This paper gives definite numerical and graphical data for the variation of intensity with wave-length in the visible spectrum of various sources of light such as the Hefner lamp, the ordinary gas flame, the petroleum flame, the acetylene flame, the Nernst filament, the lime light, the magnesium light and the carbon arc light; also in the spectrum of incandescent bodies such as carbon, platinum and zinc oxide at known temperatures.

Hitherto our knowledge of these spectra has been relative, each being compared with some other taken as a reference standard. It is now possible, however, to reduce all spectrophotometric comparisons to absolute measure.

A Note on Interference with the Bi-Prism. WM. MCCLELLAN, University of Pennsylvania.

The condition that diffraction and interference lines obtained by means of the biprism shall be seen separately, depends on the relative positions of the screen prism and slit, and the angle of the prism. The writer has taken several photographs to illustrate the various fields which may be obtained from the same prism.

The Evolution of Hydrogen from the Cathode in Gases and its Association with Cathode Rays. CLARENCE A. SKINNER, University of Nebraska.

Exhibit of Liquid Air Machine in Operation. ARTHUR W. GOODSPEED, University of Pennsylvania.

DAYTON C. MILLER,
Secretary of Section B.

THE CONVENTION OF THE ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

THE eighteenth annual convention of this association was held in the Chamberlain Hotel, at Des Moines, Iowa, November 1–3. It was the first meeting under the new constitution, which reduces the number of sections from five to two; and the advantage of the new plan was very marked in enabling delegates to follow the discussions more closely, and in concentrating the deliberations upon questions of administration and methods of work. The two sections under the present constitution are (1) on college work and administration, and (2) experiment station work.

The general sessions were presided over by Dr. W. O. Thompson, of the University of Ohio, who delivered the customary presidential address. This dealt with 'Some Problems in the Colleges of Agriculture and Mechanic Arts,' and gave special attention to the agricultural phase of their work. Among the problems noted were the conditions in the agricultural communities, the much-discussed tendency away from the farm, and the frequent lack of opportunity on the part of the farmer's boy for individual initiative. It was urged that farm life must not be the refuge of necessity, that not all farmers' sons are suited to be farmers any more than all lawyers' sons are suited to that profession, and that marked changes in farming have taken place in recent years which call for special aptitude and training quite as much as any other work in life. It was pointed out that intelligent operation of the farm is now necessary for any margin of profit, and the fallacy that unintelligent men can make successful farmers or satisfactory farm laborers was denounced. 'We need to know that intelligence on the farm will produce results just as surely as elsewhere,'

and this leads to the requirement for agricultural education.

It was pointed out that the agricultural colleges and the agricultural departments of these institutions have been working under the disadvantage of too little money, and that there has been a lack of appreciation that agricultural education must necessarily be a very expensive form of education, calling for extensive equipment which must be maintained at considerable outlay, and other items not commonly met with in laboratory work. A plea was made for the introduction of agriculture into the rural schools, and for an extension department of the college to stimulate interest in agricultural education in the rural communities. The agricultural colleges should furnish the inspiration and initiative for these movements, and there is need of conducting a propaganda in their interest, since agriculture differs from other industries in that it will not take care of itself. The speaker held that 'the problem of agricultural education will not be solved until the agricultural colleges have been brought into close and vital relations to the agricultural populations.'

The report of the executive committee, submitted by Dr. H. C. White, chairman, described the efforts of the committee in behalf of the bills for establishing mining schools at the land-grant colleges, and for the further endowment of the experiment stations, now pending in congress; and the conferences of the committee with the secretary of agriculture and other officials of his department relative to cooperation between the department and the experiment stations. The report led to the discussion of the relations of the experiment stations and their work to the department of agriculture.

In the course of the discussion upon this subject, a resolution was introduced by Dr. W. H. Jordan, of New York, recognizing the mutually advantageous relations which have existed between the department and the experiment stations of the several states, but recording the belief of the association that the continuation and development of these relations and the maintenance and progress of efficient research in agricultural science 'demand that the autonomy and paramount position of the stations as institutions of research and experimentation be inviolably maintained within their respective states, in accordance with the terms and spirit of the Hatch Act.' The resolution instructed the executive committee to request a hearing before the proper committees of congress, for the purpose of presenting the work and claims of the experiment stations, in order that congress may be properly informed as to the work of these institutions and its value to agricultural practise; and, furthermore, to continue conferences with the secretary of agriculture relative to cooperation between his department and the stations. This resolution was adopted by the association.

The committee on the collective exhibit of the agricultural colleges and experiment stations at St. Louis, through its chairman, Dr. W. H. Jordan, presented a progress report, briefly enumerating some of the features relating to the exhibit and noting the awards granted to it.

There were the usual reports of the bibliographer, by Dr. A. C. True, and of the committee on indexing agricultural literature, both of which enumerated the bibliographies and indexes to agricultural science which had appeared during the year; and the committee on methods of teaching agriculture presented a report on 'The Teaching of Agriculture in the Rural Schools,' with a syllabus of an elementary course in agriculture.

The report of the committee on graduate study reaffirmed the plan of conducting a graduate summer school of agriculture un-

der the auspices of the association, and recommended that the school be held in future every two years, beginning, if possible, with the coming summer. The committee was empowered to arrange for the holding of such schools, and each agricultural college was requested to make an annual contribution of $25 to aid in their maintenance.

The committee on uniform fertilizer and feeding stuff laws submitted a brief report, through its chairman, Dr. H. J. Wheeler, which dealt in part with the question of nomenclature in reporting the results of analysis; this matter was subsequently referred to a special committee, to cooperate with a similar committee of the Association of Official Agricultural Chemists.

The committee on rural engineering reported, through Dr. W. E. Stone, the progress which has been made during the year in developing courses in agricultural engineering and farm mechanics at the land-grant colleges, and enumerated some of the benefits of instruction and investigation carried on by these departments. The need of a central agency in the Department of Agriculture was emphasized, to aid these new departments of the colleges, to carry on original research, and to establish laboratories for practical tests of implements, etc.

The committee on animal and plant breeding, through Professor W. M. Hays, reviewed the activity in research along these lines, and described the formation of the American Breeders' Association.

Resolutions paying an eloquent tribute to the late Major Henry E. Alvord, a former president and member of the executive committee of the association, were presented by President James K. Patterson, of Kentucky. These recorded the high esteem and affection in which Major Alvord was held by the association, and testified to his eminent services to agriculture in the various public and private capacities in which he served.

'The Social Phase of Agricultural Education' was discussed in a paper by President Kenyon L. Butterfield, of Rhode Island. He laid down the broad proposition that the agricultural college should serve as a social agency in helping to solve all phases of the rural problem, and pointed out that this was not merely a matter of technic, but a problem of economic, political and social significance. The present courses of study at the agricultural colleges were shown to deal almost exclusively with the technical phase, and the training of the individual to become a highly specialized expert. The introduction of rural economics and the spirit which it stands for was stated to be far more than the adding of two or three subjects of study to the agricultural course, but involved the socializing of the whole spirit and method of the college. The greatest need of American agriculture to-day was declared to be social leadership. It was argued that the college should assume this leadership and should train men and women for the service. A great enlargement of extension work among the farmers was advocated in order to teach the people who can not come to the college.

An address was delivered by Director William Saunders, of the Central Experimental Farm at Ottawa, Canada, on 'The Upbuilding of Agriculture.' This reviewed the development of agricultural education and experimentation in the United States and in Canada, and noted many of the material results of the experimental work in Canada and British Columbia, especially in the introduction and improvement of cereals by selection and breeding.

SECTION ON COLLEGE WORK AND ADMINISTRATION.

The program of this section included

some of the problems of livest interest to the land-grant colleges, and the discussion served to clarify the views on a number of important points.

The question as to how far the land-grant institutions should engage in teaching elementary subjects not generally recognized as belonging to the collegiate curriculum, was opened by a paper by President W. O. Thompson, who justified bringing the elementary instruction quite low down, on the ground of the lack of proper training in the rural schools, and also commended the short courses. Dr. R. H. Jesse, of Missouri, took the opposite view, and maintained that the remedy for the condition lay in the improvement of the public school system by the introduction of agricultural studies. While this was acknowledged to be the long way, as changes of this sort are slow of realization, he believed it to be the right way, which would justify itself in the long run. He disapproved of the establishment of agricultural high schools or preparatory departments for the agricultural colleges, but thought that the college of agriculture should rest on the public school system. Professor L. H. Bailey, of Cornell University, took a middle ground upon this question, holding that while these forms of elementary instruction do not properly belong in the college and are a temporary expediency, they are entirely warranted by the fact that the land-grant colleges do not at present articulate with the common schools. He believed that the final issue would be to prepare the public schools to prepare for the land-grant colleges, as they now prepare for the colleges of arts and sciences; but as this will occupy many years, perhaps a generation, he believed that the pressing problems of to-day must be taken care of, and on that ground defended the short and low-grade courses as temporary expedients.

Other speakers presented the local difficulties in confining the instruction to a four-year course, and maintained that the short courses had first aroused genuine interest and confidence in agricultural education, and that the more elementary grades of work did not obscure the college course. Under present conditions there is a large body of young men who are not and can not be prepared to enter the regular college course, and for these young men, who come to the college in increasing numbers, elementary and short courses were demanded.

The discussion of this question was continued in a paper by President J. L. Snyder, of Michigan, upon the subject 'What Can and Should be Done to Increase the Interest in and Appreciation for the Agricultural Side of Technical Training.' President Snyder urged that the courses in agriculture must be technical, and that the agricultural department must have equal advantages in the way of equipment, teaching force and buildings, with the other departments of the college or university. Short courses were advocated for those unable to take the longer courses. The speaker described what was done in Michigan to arouse interest in the agricultural work by maintaining close relations with the public schools, advertising the institution in various ways, and running excursions to the college during August, which the past year were attended by about 8,000 people.

Dean Davenport, of the University of Illinois, urged the need of differentiation of the subject of agriculture, and a larger number of instructors to cover different phases of the subject. Great progress has been made in this direction at a number of the institutions, but in many cases the teaching force was thought to be entirely inadequate. He made the point clear that the number of men to be taught should not be the unit in manning the staff of the agricultural department, as it has often been

in the past, but that the true unit should be the subject itself. He pointed out that the University of Illinois now has more teachers in agriculture than it had students five years ago, and that as soon as the number of instructors was doubled the number of students doubled. He expressed the belief that the interest in agriculture on the part of the students was usually about in proportion to the number of instructors in that subject, and that greater differentiation and increased provision for teaching the various branches of agriculture would meet with the same result everywhere that it did at his institution.

A discussion of the degrees which should be given on the completion of the undergraduate courses in agriculture in the land-grant colleges, led by President G. A. Harter, of Delaware, brought out considerable difference of opinion, some contending for the B.S. and B.A. degrees, while others advocated the degrees B.Agr. and B.S.A. for the agricultural students, as more definitely expressing the courses which they had pursued.

The question as to the intent and purpose of the Morrill Act in regard to military instruction was introduced by a paper by President M. H. Buckham, of Vermont. The special interest in this subject has grown out of General Order 65 issued by the War Department, which prescribes the amount of military instruction which the officers detailed to the land-grant colleges for this duty are expected to require. Some of the institutions have found themselves unable to comply with these requirements, and as a result the detail has been withdrawn. President Buckham suggested that less emphasis be placed on the manual and technical branches of military training and more upon the intellectual topics in the military art, since the students at these land-grant colleges 'take military tactics as a part of a liberal education, not to fit them to serve as enlisted men.' The quite lengthy discussion following this paper showed that with the general advocacy of the importance of military instruction called for by the Morrill Act, there was a quite general dissent from the present requirements of the War Department; and the executive committee of the association was finally instructed to present the views of the association to the authorities at Washington.

SECTION ON EXPERIMENT STATION WORK.

This section considered the general subject of the breeding and improvement of plants and animals, and held a conference on the question of the amount of teaching which it is desirable for station workers to do.

The development of knowledge regarding methods of breeding plants and animals, and the working out of some of the underlying principles, were presented in a paper by Professor W. M. Hays, who expressed a strong belief in the importance of systematic work in breeding and its great commercial application.

Dr. T. L. Lyon, of Nebraska, spoke upon 'Improvement in the Quality of Wheat,' describing the methods which he is working out in this line as distinguished from selection for yield alone. Since a high yield and high nitrogen content do not necessarily go together, it was pointed out that there is danger in selecting wheat for yield alone that the quality will be injured, and hence it was maintained that the quality should be taken account of in breeding or selecting for yield.

Professor H. Snyder, of Minnesota, called attention to the difference in value of wheat for various purposes, and the lack of standards; and on his motion a committee of three was appointed on standards for determining the value of cereals.

In a paper on 'Animal Breeding,' Professor C. F. Curtiss, of Iowa, reviewed the

work which is now being undertaken in animal breeding at the experiment stations of this country, and made some suggestions for work in that line.

In the conference upon the subject of 'How Much Teaching, if Any, is it Desirable that a Station Worker Should Do?' there was a lively discussion and a free expression of opinion, which seemed to be very largely in one direction. In opening the discussion Dr. H. P. Armsby, of Pennsylvania, showed that according to the latest statistics about 54 per cent. of the experiment station workers now do more or less teaching in the agricultural colleges, and that the tendency seemed to be toward an increase. He expressed doubt as to the advantage to the station man of doing college work, and he held that at all events it should be small and of advanced character. He believed that in this agricultural work a man should be chiefly either a teacher or an investigator, and maintained that, to a certain extent, the two kinds of work call for a different attitude of mind and the use of a different set of faculties.

Dr. W. H. Jordan held that the advantage of teaching, from the standpoint of the station man, depended quite largely upon the kind of teaching to be done, which in the case of the agricultural colleges is very largely the teaching of fundamentals. Such teaching he held to be of no advantage to the investigator, although he conceded that a small amount of teaching of an advanced character, along specialties with which the investigator is dealing, might prove advantageous.

It developed from the discussion that the plan of requiring this dual service from station men was regarded as largely one of expediency, and that the requirement of too much teaching from men holding important positions on the station staff had an unfavorable effect upon the general character of the station work. It was urged that the teaching should be so arranged on the college schedule as to interfere as little as possible with the time of the station worker, and that the tendency should be in the direction of restricting the amount of teaching and limiting it to advanced work. The discussion served to enunciate anew the true function of the experiment station as an institution primarily for the higher grades of experimentation and research, and emphasized more strongly than ever before the great need of a sharper differentiation of its work and its corps of workers from the instruction department of the college.

The extent to which specialization and equipment for agricultural instruction and investigation are being carried was exemplified at the Iowa State College at Ames, where the convention spent an interesting and profitable half-day as the guests of the institution. Here the large amount of live stock kept primarily for instruction purposes (over thirty head of horses of various breeds and types), the new pavilion for stock and grain judging, the well-equipped new department of farm mechanics, the commodious soils laboratory, the new dairy building in process of construction, and the plans for the new agricultural building to cost from $250,000 to $300,000, as well as the other departments of longer standing, were typical of the rapid advancement which is making in the material equipment for agricultural education, which will place that department on a par with engineering at the better institutions.

The officers of the association elected for the ensuing year were as follows:

President—E. B. Voorhees, of New Jersey.

Vice-Presidents—J. C. Hardy, of Mississippi; K. L. Butterfield, of Rhode Island; C. D. Woods, of Maine; E. R. Nichols, of Kansas, and E. Davenport, of Illinois.

Secretary and Treasurer—J. L. Hills, of Vermont.

Bibliographer—A. C. True, of Washington, D. C.

Executive Committee—H. C. White, of Georgia; J. L. Snyder, of Michigan; W. H. Jordan, of New York; C. F. Curtiss, of Iowa, and L. H. Bailey, of New York.

Section on College Work and Administration—Chairman, R. W. Stimson, of Connecticut; Secretary, K. L. Butterfield, of Rhode Island.

Section on Experiment Station Work—Chairman, H. J. Patterson, of Maryland; Secretary, M. A. Scovell, of Kentucky.

E. W. Allen.

SCIENTIFIC BOOKS.

The American Natural History, A Foundation of Useful Knowledge of the Higher Animals of North America. By William T. Hornaday. New York, Charles Scribner's Sons. 1904. 8vo. Pp. xxv + 449.

The object of this book is to make nature available to laymen; it is also particularly addressed to teachers and parents. It is intended to be plain, practical and direct, as well as systematic and scientific. The author has evidently striven (generally with good effect) to make his exposition simple and lucid, his diagrams and synopses mnemonic, his illustrations life-like, his style lively and personal. He has a proper abhorrence of mere closet naturalists as such, and much of the information presented he has won at first-hand during many years' experience as a field naturalist in America and the far east, and as director of the New York Zoological Park. Accordingly, we find here much practical and economic zoology, invaluable matter on the extinction of American species, and the setting right of many ancient and silly myths. As the field covered includes all the principal types of vertebrates found in North America, it is not to be wondered at that slips are to be detected here and there; and in regard to the author's ideas on classification we shall offer a few criticisms.

Clear exposition is exhibited in many sections of the book, notably in the chapter on the rodents. The genera and species are sketched in a manner that should be easily intelligible to the layman and useful to the general zoologist. The chapter dealing with the ruminants is also noteworthy. There are numerous excellent synopses arranged in brackets, and for each class of vertebrates there is a chart of the different orders. Admirable charts show the distribution of mountain sheep, elk, etc., and a convenient map of North America appears on the inner back cover.

The drawings, while of uneven merit, are full of life and action and have good teaching value. Many of them, as, for example that which represents the harpooning of a twenty-foot eagle ray, will surely arouse the enthusiasm of young readers.

Certain groups, *e. g.*, the ducks, are illustrated with great fullness. There are many photographs from life, among those of especial merit being the well-known photograph by Umlauff of an old male gorilla, the photograph by Professor Nathorst of a herd of wild musk oxen, the photographs of the white-tailed deer, bison, owls, pelicans, flamingos, condors, etc., and several of crocodiles; a most remarkable one is that by Beck showing a great multitude of the marine iguanas of the Galapagos gathered together on a rocky shore. There are excellent photographs of the principal snakes; and among Amphibians one photograph shows the northern tree frog with the vocal sack protruded.

The author aims to amuse as well as to instruct, as shown in the following typical passage:

> Whenever you see a brown-coated burrowing animal, the length of a small rat, but twice as thick, with a big pouch in the skin of each cheek, a swinish appetite, a set of long claws like burglars' tools on each fore foot and a most villainous countenance and temper you may know that it is a pocket gopher. The pockets in his cheeks are to enable him to carry extra large quantities of stolen potatoes and seeds.

It is regrettable that in the endeavor to be popular the author repeatedly ascribes human characteristics to those animals, such as pikes, for example, which, so far as we know, are utterly unlike man in their psychic constitution. The same straining for popularity also leads in a number of passages to sensationalism and 'rhetoric.'